

Kennecott Utah Copper Corporation
Tailings Modernization Project
P.O. Box 352
Bingham Canyon, Utah 84006-0352
(801) 252-2801

Robert E. Dunne
Project Manager

December 19, 1996



M/036/015
Pls FILE

Kennecott

Mr. Don Ostler
State of Utah
Department of Environmental Quality
Division of Water Quality
PO Box 144870
Salt Lake City, UT 84114-4870

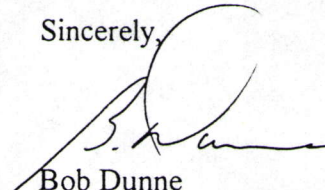
Dear Mr. Ostler:

Subject: Final Closure Plan, Ground Water Issues, Kennecott Tailings Impoundment,
Ground Water Discharge Permit UGW350011

The purpose of this letter is to provide the Division of Water Quality with a final closure plan addressing ground water issues for the Kennecott Tailings Impoundment. This closure plan satisfies the requirements of Part I Section K Item 9 of the Ground Water Discharge Permit for the Tailings Impoundment, permit number UGW350011.

If you have any questions, please call me at 252-2801, or contact Ric Jones at 569-7910.

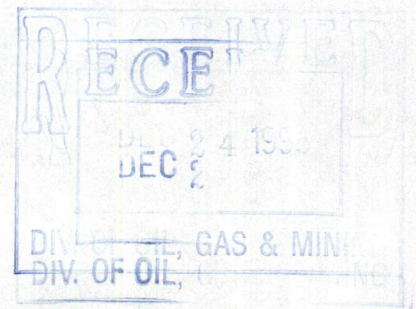
Sincerely,



Bob Dunne
Project Manager

RED/RJ:bt

cc: Elaine Dorward-King
Paula Doughty
R. Jones
File: ops-gw-tail-corres
12.250.210



FINAL CLOSURE PLAN

GROUND WATER ISSUES

KENNECOTT TAILINGS IMPOUNDMENT

GROUND WATER DISCHARGE PERMIT UGW350011

December 21, 1996

TABLE OF CONTENTS

INTRODUCTION

CLOSURE PLAN

TRANSITION PLAN FOR THE EXISTING IMPOUNDMENT

CLOSURE PLAN FOR THE NORTH EXPANSION

RECLAMATION AND VEGETATION

WATER DISCHARGES AFTER CLOSURE

Surface Water Drainage

Ground Water Drainage

Water Balance

MONITORING DURING CLOSURE

MONITOR POINTS

Ground Water

Surface Water

POST CLOSURE MONITORING

DETERMINATION OF COMPLIANCE

REPORTING AND NOTIFICATION

INTRODUCTION

The Tailings Impoundment is currently anticipated to be closed when it reaches the estimated design capacity. Current projections are that the full capacity will be utilized in 25 to 30 years. The purpose of this document is to provide a general description of the closure of the Tailings Impoundment and to discuss the measures that will be taken after closure to protect ground water in the area of the Tailings Impoundment. This document fulfills the requirements of Part I Section K Item 9 of the Ground Water Discharge Permit for the Tailings Impoundment (the Permit), permit number UGW350011.

CLOSURE PLAN

The Tailings Impoundment will be closed in two phases. The first phase will be the transition of operations from the existing impoundment as the North Expansion becomes available for tailings storage, with the subsequent closure of the North Expansion at the end of its useful life. This document provides a general outline of the closure plans. Detailed closure plans are provided in the document titled "Tailings Modernization Project DOGM Consolidated App'n" submitted to the Division of Oil Gas and Mining (DOGM) on March 15, 1996. The reader is referred to that document for additional details.

TRANSITION PLAN FOR THE EXISTING IMPOUNDMENT

Transition of tailings storage activities from the existing impoundment will include the following activities:

- Removal of unnecessary facilities
- Reclamation and vegetative stabilization of areas awaiting vegetation
- Vegetation of the embankment and surface of the impoundment.
- Monitoring

Reclamation and vegetation of the existing impoundment will be achieved in stages as the transition is made between the existing impoundment and the North Expansion. Because the top surface of the existing impoundment is large, this area will be subdivided into a number of smaller areas. These areas will be reclaimed in a systematic, sequential manner as described in the Tailings Modernization Project Fugitive Dust Abatement Program submitted to the Division of Air Quality on June 7, 1994, while tailings continue to be deposited onto unreclaimed areas. This procedure is designed to minimize fugitive dust emissions to the air. Reclamation is anticipated to begin in the western portion of the impoundment and proceed towards the decant pond in the northeast corner of the impoundment over a several-year period. Thus, portions of the existing impoundment will be reclaimed and removed from use as the North Expansion is brought on-line.

CLOSURE PLAN FOR THE NORTH EXPANSION

Closure of the expanded impoundment will involve the removal of remaining above ground man-made structures. Structures such as the toe ditch and the 007 outfall will remain to control drainage from the impoundment. Reclamation of the impoundment will be done in accordance with a reclamation plan approved by DOGM. Techniques employed will be similar to those used to transition operations from the existing impoundment, with updated technology as appropriate. As with the transition from the existing impoundment, the surface of the impoundment will be subdivided into a number of smaller areas that will be reclaimed in a systematic, sequential manner, while tailings continue to be deposited onto unreclaimed areas.

RECLAMATION

Reclamation of the Tailings Impoundment will occur both during operation of the impoundment and at closure. The main reclamation objectives during construction and operation are to:

- Vegetatively stabilize all areas disturbed by construction activities as soon as possible after the activity is completed,
- Reclaim the rises of the exterior slopes of the impoundment on a seasonal basis, and
- Establish a vegetative community suited to wildlife habitat.

Primary objectives for final reclamation are to:

- Reclaim the top surface of the impoundment for long-term fugitive dust and erosion control, with minimal maintenance requirements,
- Establish a vegetative community best suited to wildlife habitat, and
- Provide for the long-term vegetative stabilization of the impoundment.

Kennecott's ongoing reclamation program has produced a vigorous community of grasses, forbs, shrubs, and trees on the Tailings Impoundment which is used as a habitat by a variety of wildlife. This proven approach will be the basis for reclamation of the impoundments at closure. Specific methods used to achieve these objectives are detailed in the document "Tailings Modernization Project DOGM Consolidated App'n".

WATER DISCHARGES AFTER CLOSURE

Surface Water Discharges

Closure of the Tailings Impoundment will modify both surface water and tailings water drainage.

After closure, the only tailings water discharge from the impoundment will be seepage draining from the embankment of the existing impoundment and seepage draining from the blanket drain constructed beneath the embankment of the North Expansion. Although the rate of seepage discharge will diminish once tailings inflows stop, seepage from the Tailings Impoundment will continue indefinitely. Large decreases in the rate of seepage are anticipated to result from the termination of embankment construction during the first year after closure. Beyond the first year, seepage rates will continue to decrease, although more slowly, in the years beyond closure.

Precipitation falling on interior portions of the Tailings Impoundment will not be drained as surface water from the impoundment. The dikes, constructed for the deposition of the final tailings lift as each section is closed, will be constructed at an elevation sufficiently high enough to prevent any potential run-off from the interior portions of the closed areas. The collected water will pond internally and either soak in or evaporate. Precipitation falling on the Tailings Impoundment embankment will be drained to the toe collection ditch surrounding the impoundment.

The toe drain will be left in place after closure to facilitate drainage of surface water from the tailings embankment and seepage water to the C-7 ditch, Lee Creek, and ultimately to the Great Salt Lake. The discharge of this water will occur at the 007 Outfall point and will be in accordance with the regulatory requirements and limits set forth at that time.

Ground Water Discharges

Neither the quality nor the quantity of potential discharges to ground water will change significantly upon closure. The elevation of the saturated tailings water surface will start to decline once the deposition of new tailings water is stopped. However, the rate of decline in the saturated tailings water surface will be so small that it will not significantly affect the rate of tailings water seepage through the foundation surface. Since no additional water will be applied to the surface of the impoundment, the waters potentially discharged are those stored during tailings deposition and precipitation onto the impoundment surface. The quality of this water will be the same after closure as is currently being discharged.

Water Balance

A detailed water balance for the Tailings Impoundment after closure was presented in the report "Acidification Potential of the Kennecott Tailings." The results of this water balance indicated that, after closure, the volume of water received as precipitation was only slightly (5%) greater than the volume of water lost from the impoundment due to evaporation and evapotranspiration. The model used in this report assumed that run-off would be discharged from the impoundment and that any water remaining after accounting for evaporation, evapotranspiration, and run-off would be discharged as seepage. Since only a very limited portion of the impoundment will be allowed to drain

as surface water, the volume assumed to be lost as surface water will, instead, be lost as evaporation and seepage. Assuming that all of this water will infiltrate, the rate of seepage from the impoundment will be 0.78 inches/per year. This corresponds to 400 gallons/minute (gpm) for the entire Tailings Impoundment. This water will be discharged as both lateral discharge out the sides of the impoundment and, eventually, as seepage to ground water. These calculations assume that there will be no change in the volume of water stored in the impoundment.

Additional water will, however, be discharged as water released from storage. Once the deposition of new tailings is stopped, the water stored within the tailings will start to drain, both as lateral discharge to surface water and as seepage to ground water. Initially, the rate of discharge will be the same as current rates of discharge and will decline rapidly as time passes beyond closure. Initial seepage rates at closure are estimated at:

• Discharge to ground water at the time of transition off of the Existing Impoundment *	620 gpm
• Discharge to ground water from the North Expansion at closure *	206 gpm
• Seepage to surface water at the time of transition off of the Existing Impoundment *	2500 gpm
• Seepage to surface water from the North Expansion at closure **	<u>2700 gpm</u>
Total	6026 gpm

The estimate of the rate of seepage for the existing impoundment is high because most of the water stored in the existing impoundment will have drained by the time the North Expansion is closed.

The volume of water stored within the combined impoundments at closure will be approximately 130 billion gallons. Using the initial seepage rates as the maximum seepage rate, the volume of water stored in the Tailings Impoundment would take a minimum of 40 years to drain. The actual rate will be much lower since the rate of seepage will decline rapidly in the period immediately after closure. It is anticipated that hundreds of years will be required before the rate of seepage into the impoundment is in equilibrium with the rate of seepage out of the impoundment.

* Data taken from "Final Environmental Impact Statement for the Kennecott Tailings Modernization"

** Data taken from the report "Mass Balance" prepared for Kennecott by Shepard Miller, Inc.

MONITORING DURING CLOSURE

Monitoring of the Tailings Impoundment will continue as specified in the Permit for operating conditions, as sections of the impoundment surfaces are taken out of service. However, additional samples of the tailings will be collected as the final lift (last 3 feet) of tailings is placed in the section being closed. These samples will be "grab" samples collected from the tailings spigots located in the

area being closed. The sampling rate will be approximately 1 sample per each 200 acres being closed. These samples will be analyzed to determine their acid generating potential. If these analyses indicate that a significant acid generating condition is likely to exist within the surficial tailings, remedial actions will be considered and, if necessary, implemented. Evaluation of the potential for developing significant acid generating conditions will be based on our past history in meeting reclamation goals given similar test results. Tailings samples will also be collected from the surface of closed sections of the impoundment after the final lift of tailings is placed, but prior to vegetation. These samples will also be collected at a rate of 1 sample per each 200 acres closed. These samples will be analyzed to determine their acid generating potential. Sampling and analyses will be as specified in Appendix A of the Permit.

POST-CLOSURE MONITORING

MONITOR POINTS

Post-closure monitoring will consist of ground and surface water monitoring and will be implemented upon closure of the North Expansion.

Ground Water

The network of ground water monitoring wells used for operational monitoring will be used for the Post-Closure monitoring. If these monitoring wells are damaged, contain more than two feet of sediment, or have a substantially decreased yield, they will either be redeveloped or replaced. Samples collected from these wells will be analyzed for the same list of constituents as specified for operational monitoring in the Permit. Analytical results will be evaluated as specified in Part I Section H of the permit to determine whether ground water quality has been affected by the impoundments.

These wells will be sampled annually for five years after closure. If, after five years, no statistically evident degradation of the water quality is measured, KUC will petition the Executive Secretary to discontinue post-closure monitoring. The statistical significance will be evaluated using the methods described in the Statistical Methods For Evaluating Ground Water Monitoring Data For Hazardous Waste Facilities, Volume 53, No. 196 of the Federal Register, October 11, 1988.

Procedures for installing monitoring wells, collecting and analyzing ground waters and QA/QC samples are provided in KUC's Ground Water Characterization and Monitoring Plan (1996). This plan will be updated as necessary to reflect post-closure requirements. These procedures will be updated as needed to reflect post-closure requirements.

Surface Water

Surface water monitoring will continue at the point of surface water discharge from the toe collection ditch to Lee Creek (sampling point TLS1436). Surface water samples will be analyzed for the analytes specified in the Permit using the methods specified in the Permit.

REPORTING AND NOTIFICATION

KUC will prepare an annual summary of the post-closure monitoring results that will be submitted by the end of March each year for the preceding calendar year. Information regarding monitoring well logs and construction details will also be submitted for replacement or new monitoring wells installed during the previous calendar year.

Compliance Status Reporting

Compliance will be determined by the requirements of Part I Section H of the Permit. Should any compliance problems be encountered, the actions specified in this section would be taken.

Surface water monitoring will be conducted for informational purposes only and no compliance conditions are specified.